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EXAMINER	
LEUNG, PHILIP H	
ART UNIT	PAPER NUMBER
3742	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/24/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/516,831	HEPWORTH ET AL.	
	Examiner	Art Unit	
	Philip H. Leung	3742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 December 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-14 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The newly added limitation "the generator means being such that it generates the electromagnetic energy at such a frequency that the tyre becomes heated as a result of the tyre being made of rubber material having dielectric properties which enable the rubber material to interact with the radiated electromagnetic energy of the said frequency and become heated" is new matter not disclosed in the original disclosure. More particularly, the original disclosure does not specifically show the material of the tyre being made of "rubber" material. Furthermore, there is nothing in the specification about the relation between the dielectric properties and the frequency of the electromagnetic energy radiated by the generator means as now claimed. Cancellation of the new matter is required.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3 and 7-14 are rejected under 35 U.S.C. 103(a) as being obvious over Nissan Motor (JP 3-189216), in view of Petersen (US 2003/0034340) or Sumitomo Rubber Ind Ltd (JP 9-193159) (hereinafter, Sumitomo) (all previously cited) and further in view of Bjorkman et al (US 4,157,930) (previously cited by the applicant) or Peterson (US 3,867,606) (newly cited).

Nissan Motor shows an apparatus and method for warming an inflated tyre on a wheel to a temperature required for vehicle racing comprising the tyre on the wheel, generator means (10, 32) for generating electromagnetic energy of a frequency that heats the tyre, temperature indicator means (41) for indicating the temperature of the tyre, and control means (43) for controlling the operation of the apparatus (see Figures 1-7 and the English translation attached at the end of the Office action). It is clear from the translation and Figure 3 that the tyre is on the wheel of a car as it states that the example (in Figures 3-8) is the example in which tyre temperature raising device 11 is applied to the tire 13 connected to the independent suspension mechanism 12 of the vehicle (see lines 8-21 on page 7 of the translation). Therefore, Nissan Motor shows every feature except for a container for enclosing the tyre being heated and the type of the electromagnetic energy used. Petersen shows a tyre heating device having a heating element 3, thermostat 4 and a container 6 for enclosing inflated tyres for heating the same before the start of a race (see Figure 1 and paragraphs [0010] – [0031]). Sumitomo teaches that it is well known in the art to use a container 3 for heating tyres TH(T) with high frequency electromagnetic generator 4 to contain the radiation (see Figure 2 and the English abstract). It would have been obvious to an ordinary skill in the art at the time of invention to modify Nissan Motor to use a container for enclosing the tyres being heated for a portable unit, in view of the teaching of Petersen and for a safe system in view of the teaching of Sumitomo. Furthermore,

regarding the new limitation added to claims 1 and 14, although Nissan Motor uses a conductor 14 in the tyre for heating as it mainly uses a high frequency induction heater 10, it also suggested that the high frequency generator 10 may be a magnetron (see page 5, lines 13-15). It is well known that a magnetron generates an electromagnetic energy at a microwave frequency which causes direct heating in a material having a high dielectric loss constant, such as rubber tyres, by dielectric heating as shown in Bjorkman (see Figure 10, col. 3, lines 38-53 and col. 6, lines 15-52) and Peterson (see Figure 1 and col. 1, line 10 – col. 2, line 52). It would have been obvious to an ordinary skill in the art at the time of invention to further modify Nissan Motor to choose a magnetron as the electromagnetic energy source so that the rubber tyre can be directly heated without the use of a conductor to lower cost, in view of the teaching of Bjorkman or Peterson. In regard to claims 9, 11-13, Nissan Motor shows vertically mounted wheel (claim 9); the use of radio frequency as the electromagnetic energy (claim 11); metal conductors 14 as an active part (claim 12) and the device is portable (claim13).

4. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nissan Motor (JP 3-189216) (previously cited by the applicant), in view of Petersen (US 2003/0034340) or Sumitomo Rubber Ind Ltd (JP 9-193159) combined with Bjorkman et al (US 4,157,930) or Peterson (US 3,867,606), as applied to claims 1-3 and 7-14 above, and further in view of Searle et al (US 3,566,066) (previously cited by the applicant).

As set forth above, Nissan Motor combined with Petersen or Sumitomo and Bjorkman or Peterson shows every feature as claimed except for the explicit showing of the door structure. Although not shown explicitly, a door must obviously be provided in the container in order to

load and discharge of the tyre and to shield the microwave energy from escaping from the chamber. Anyway, Searle shows a microwave heating chamber 1 with a lid 2 for heating a tyre on a rotating support 4 and a door operating assembly 3 for quick opening of the door (see Figure 1 and col. 2, lines 18-40). It would have been further obvious to an ordinary skill in the art at the time of invention to modify Nissan Motor combined with Petersen or Sumitomo and Bjorkman or Peterson to provide a door with a quick opening device so that the tyre can be easily loaded and unload from the chamber, in view of the teaching of Searle. In regard to claim 6, Searle shows that the chamber 1 is a cylindrical shape.

5. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Philip H Leung whose telephone number is (571) 272-4782. The examiner can normally be reached on flexible.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robin Evans can be reached on (571) 272-4777. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Philip H Leung
Primary Examiner
Art Unit 3742

P.Leung/pl
1-17-2007

attachment to S.N. 10/516,831

PTO 01-[PTO 2006-5007

Japanese Patent
Hei3-189216

TIRE TEMPERATURE RAISING DEVICE

Author (Gunchichiro Origa)

UNITED STATES PATENT AND TRADEMARK OFFICE

Washington, D.C. June 2006

Translated by: Schreiber Translations, Inc.

Country	:	Japan
Document No.	:	Hei3-189216
Language	:	Japanese
Inventor	:	Masaji Owada, Ukio Fukunaga, Tadasugu Tamamasa
Applicant	:	Nissan Automobile Co.,
IPC	:	B60c 23/00; 19/00
Application Date	:	December 20, 1989
Publication Date	:	August 19, 1991
Native Title	:	タイヤ昇温装置
English Title	:	Tire temperature raising device

Specification

1. [Title of the invention]

TIRE TEMPERATURE RAISING DEVICE

2. [Scope of the patent claims]

(1). it is the tire temperature raising device characterized such that an a conductor is embedded inside of the tire grounding surface, and the high frequency generating source is positioned in a close proximity of the said tire grounding surface,

(2). it is the tire temperature raising device described in claim item 1 characterized as being equipped with the control means such that the temperature sensor is set up near the aforementioned tire, and based on the signal of the temperature sensor, the high frequency current generated by the high frequency generating source is controlled.

3. [Detailed explanation of the invention]

The present invention relates to the tire temperature raising device and in more details, is related to the tire temperature raising device which raises the tire temperature at the start of running.

[Prior arts]

In general, before running the vehicles that was parked or stopped for a long time, the surface temperature of the tire grounding surface and the atmospheric temperature are about the same, and compared with the surface temperature of the tire grounding

surface of the vehicle after running for a long time, it is lower quite a bit. The difference of the surface temperature of the tire grounding surface before and after running is big particularly during winter, producing a big difference in the running characteristics of the vehicles.

When the vehicle starts to run and the surface temperature of the tire starts to climb, (1). The gripping strength in which the tire grips the road increase, the operation stability of the vehicle improves. And (2). Rolling resistance of the tire decreases, fuel consumption characteristics improves. That is, as shown in figure 9, as the running times passes, the surface temperature of the tire grounding surface climbs, however, as this surface temperature climbs, rolling resistance decreases (or rolling resistance coefficient). At about 1~ 2 hours after starting to run, the surface temperature of the tire grounding surface saturates and becomes fixed, and rolling resistance decreases a lot.

Regarding the traditional tire temperature raising device which aggressively raises the temperature of the tire by using the temperature raising device, for instance, there is one described in Japan patent publication Hei 1-108894 Gazette. This is, as shown in figure 10~12, the electrical conductive rubber sheet 2 is specially pasted inside of the tire 1, and an electrode 3 on both side of an electrically conductive rubber sheet 2 is connected to battery 5 not shown in figure via wire 6. The voltage of a battery

5 is applied on an electrically conductive rubber sheet 2, thus an electrically conductive rubber sheet 2 generates heat, and by this heat of an electrically conductive rubber sheet 2, the tire is heated from inside, thus raising the temperature of the tire.

[Problems the present invention attempts to solve]

However, regarding such traditional tire temperature raising device, a special heating body was specially pasted inside of the tire, and these were connected to the electrical power source, hence, the structure was that, it was connected via slip ring 7 that rotates while the fixed side (car body) and rotating side (tire) are in contact. Because of this, while using, the durability of slip ring 7 decreases, contact defects and the like are generated, the reliability was deficient, which is a problem. And, during the removal and mounting of the tire, as the electrical connection function, slip ring 7 is interpositioned, hence, it is necessary to electrically disconnect and connects by contacts during the removing and mounting work of the tire 1. The problem is that workability such as electrical connection testing after mounting and the like was poor.

Hence, the present invention was executed targeting on such traditional problems, the purpose is that without using slip rings, it is made non-contact, thus reliability is improved, and also, during tire removing and mounting, also, electrical disconnection and connection and electrical connection testing and the like are not

necessary, hence, the workability is greatly improved.

[Means to solve the problems]

The tire temperature raising device of the present invention is characterized such that in order to attain the above described purpose, the conductor is embedded in the tire grounding surface, and the high frequency generating source is positioned close to the said tire grounding surface.

And, it is preferred that the tire temperature raising device is equipped with control means wherein temperature sensor is set up close to the aforementioned tire, and based on the temperature sensor signals, high frequency current generated by high frequency generating source is controlled.

Here, regarding high frequency generating source, high frequency current can flow to the coil from high frequency generating source, or a magnetron can be used.

[Actions/operations]

Regarding tire temperature raising device of the present invention, since a conductor is embedded under the grounding surface of the tire, and also, high frequency generating source is positioned close to the grounding surface of the tire, high frequency energy is generated from high frequency generating source, thereby, a multiple vortex current 1 is generated by the skin effect on the outer most layer of the skin of the conductor. By this vortex current 1 and resistance R of the conductor, joule heat J is generated in

the conductor as shown in the formula J=J' R, and this heat is transmitted to the rubber in the periphery of the conductor, furthermore, is transmitted to the rubber close to the grounding surface of the tire, thus rubber temperature is raised, and surface temperature of the grounding surface of the tire is raised.

[Embodied examples]

First of all, the basic concept of the present invention will be explained based on the drawings.

Figure 1 and 2 are the outline drawings showing the basic concept of the tire temperature raising device of the present invention.

In figure 1, 11 is the tire temperature raising device, and in tire temperature raising device 11, a conductor 14 is embedded inside the rubber members under the grounding surface 13a of the tire 13, and the high frequency generating source 10 is positioned close to the grounding surface 13 of the tire 13.

In such a structure, when the vehicle starts to run, and the tire 13 starts to rotate, simultanouesly switch is turned on, then, high frequency energy is generated from high frequency generating source 10. This high frequency energy 10A permeates the grounding surface 13a of tire 13 and is transmitted to the conductor 14 under the grounding surface. Due to this high frequency energy 10A, as shown in figure 2, vortex current 14AJ is generated by skin effect on the outer most layer of the outer most skin layer 14a of the conductor 14, due to this vortex current 14AI and resistance R of

the conductor 14, joule heat J ($=I^2R$) is generated in the conductor 14, thus raising the temperature of the conductor 14. This joule heat J is transmitted to the rubber inside of the tire, the surface temperature T deg C of the tire is raised (hereafter all the temperature is expressed in centigrade and deg c symbol is omitted).

The following explains the embodied examples of the present invention based on the drawings.

Figure 3~8 are the drawings showing one embodied example of the tire temperature raising device of the present invention, and for the same structure as figure 1 and 2, same symbols will be attached. This embodied example is the example in which tire temperature raising device 11 is applied to the tire 13 connected to the independent suspension mechanism 12 of the vehicle.

In figure 3~5, tire 13 is assembled to the rim 15, and mounted on the hub 17 via wheel 16. Hub 17 is axially supported on the spindle 18 of the lower edge part of the independent suspension mechanism 12 and also is connected to the suspension lower arm 19. The upper edge part of independent suspension mechanism 12 is mounted on the car body 21 via strut up insulator 20. Independent suspension mechanism 12 has the spring 22, damper 23, and the strut 24 which supports damper 23.

In figure 5, tire 13 consist of a pair of bead 25 fixed to the rim 15, and steel cord covered by the rubber, and it is equipped with carcass 27 bent in troidal shape between beads 26, a plural

number of belts 29 which consist of steel cords 28 which is the conductor covered by rubber and positioned outside of the crown part of the carcass 27, and covering rubber 30 which covers the outside of the carcass 27 and belt 29. 30 A is the grounding surface which contacts the road surface of the tire 13. That is, under the grounding surface 30A of the tire 13 is embedded a steel cord 28.

32 is a coil, and coil 32 is the emission part of the high frequency energy of the high frequency generating source, and it is set up so that it covers the crown part 13a of the tire 13 in a close proximity of the upper side of the grounding surface 30a of the tire 13, and is supported by the bracket 33 mounted on the strut 24. 34 is a lead wire and one side of the lead wire 34 is connected to coil 32 and other side (it is shown by the symbol 35 in the total block drawing in figure 7) is connected to a high frequency generator 35 not shown in the figure which is the high frequency generating source. A high frequency generator 35, lead wire 34 and coil 32 constitute the high frequency generating source.

In figure 7, high frequency generator 35 is connected to a battery 37 via the switch 36 which is linked together with an ignition. Control means 40 is mounted between coil 32 and high frequency generator 35, and control means 40 controls the high frequency current which flows to coil 32 by going through the lead wire 34 from high frequency generator 35, based on the signals from surface temperature sensor 41 and car speed sensor 42. Control means 40 is equipped

with the control circuit 43 which consists of a microcomputer, and control circuit 43 controls the surface temperature of tire 13 according to the flow chart shown in figure 8. The tire surface temperature sensor 41 consists of infrared ray temperature sensor and is set up near tire 13, and measures the tire su-tmx without contacting it, and can transmit temperature signals S1.

Next, the operation will be explained.

Figure 8 is a flow chart which shows the process executed repeatedly at every specified calculation cycle within the control circuit 43, and tire temperature raising device operation is explained by this flow chart.

When the ignition key is turned on, switch 36 is linked together with ignition key and closed (ON), high frequency generator 35 generates high frequency current, and also, the control circuit 43 of the control means 40 acquires the waiting state. First, the micro computer inside the control circuit 43 is initialized. (Step P1).

Next, regarding control circuit 43, tire surface temperature sensor 41 detects the surface temperature T of the tire 13, and reads the temperature signals S1 sent (Step P2); car speed sensor 42 detects the car speed V, and reads the car speed signals S2 transmitted (Step P2). At step P2, it is decided whether the surface temperature T of the tire 13 is at the specified temperature T0 or greater, and if it is less than specified temperature Ta, at step P5, it is decided whether or not the vehicle is at a stop state from the car speed

V that was already read. If the vehicle is not at the stop state, the coil 32 is energized by the high frequency current of the high frequency generator 35(ON) then, returns to step P5.

If the coil 32 is energized by high frequency current, then, in coil 32, high frequency magnetic flux is generated in coil 32 as though it passes through the crank part of tire 13 as shown in arrow A in figure 5. Then, as shown in figure 6, vortex current I 45 is generated in the outer most layer of the skin 28a of the steel cord 28 under the grounding surface 30A of the tire 13. Due to the electrical resistance R of this vortex current I 45 and steel cord 28, joule heat ($J=I^2 R$) is generated in steel cord 28, temperature of the steel cord 28 rises. The heat of the steel cord 28 is transmitted to the surrounding rubbers, and tire 13 is warmed, thus raising the surface temperature of the tire.

At step P2, the temperature signals S1 sent by tire surface temperature sensor 41 is read, and car speed signals S1 generated by the car speed sensor 42 is read again. At step P4, it is decided whether or not surface temperature T of the tire 13 is at the specified temperature T0 or greater, then, when it is less than the specified temperature T0, at step P2, it is decided whether or not the vehicle is in a stop state. If it is at the stop state, at step P7, the energizing state from high frequency generator 35 to coil 32 is terminated (OFF). When the vehicle is not in a stop state, the high frequency current of high frequency generator 35 is energized to

coil 32 at step P4 then it returns to step P2. Such a repeating operation is continued until the surface temperature T of the tire 13 reaches the specified temperature T0. At step P7, if the surface temperature T exceeds the specified temperature T0, at step P7, energizing from coil 32 from high frequency generator 35 is stopped (OFF).

Here, when outer air temperature is 20 deg C, the case is hypothesized in which tire surface temperature is kept at 60 deg C, based on the well known value as in the home cooling range and the like, I' which is the high frequency current required by aforementioned coil 32, H which is the force of the magnetic field, the J which is the joule heat generated by steel cord 28 is sought.

I': frequency 14.5 Hz, current 2.53A

H: 15.9 oersted

J: 2,230 J/S

However, above described value is based on the fact that winding number per unit length of coil 32 is 1,000 winding/m.

According to such a structure, after the vehicle starts to run, high frequency current flows to the coil set up near to the grounding surface 30A of the tire 13, vortex current 45 is generated via the magnetic flux in the outer most layer of the skin layer 28a of the steel cord 28 under the grounding surface 30A of the tire 13, it is warmed until the surface temperature of the tire reaches a specified temperature T0. Hence, the tire does have to be broken

in by driving, immediately after starting to run, surface temperature T of the grounding surface 30A of the tire 13 climbs up to the specified temperature T0. Because of this, at the early stage after starting to run, gripping performance and rolling resistance can be optimized as almost at the same time.

And, since the heating of the grounding surface of the tire is made to be non-contacting electrically, the reliability can be improved greatly, and also, during removing and mounting of the tire, it is not necessary to electrically disconnect and connect or test turning electricity on and the like, thus workability can be greatly improved. And, the tire does not have to be very special; the tire which uses traditional steel belt can be used.

[Effects]

As explained above, according to the present invention, a conductor is embedded under the grounding surface of the tire, and also, a high frequency generating source is positioned in a close proximity of the grounding surface of the tire, and by the joule heat generated inside the conductor, the temperature of the grounding surface of the tire is rapidly raised, at the early stage after starting to run, running characteristic of the vehicle is improved. And this temperature rise is done non-contactingly without using a slip ring, the reliability is greatly improved, and the during removing and mounting of the tire, there is no electrical disconnection/connection, and turning on electricity and the like,

thus greatly improving the workability.

4. [Simple explanation of the drawings]

Figure 1 and figure 2 are drawings showing the basic concepts of the present invention, figure 1 are an outline drawing showing its basic structure, figure 2 is a conceptual drawing showing its gist. Figure 3 ~ figure 8 are drawings showing one embodied example of the tire temperature raising device of the present invention, figure 3 is a front surface drawing of its main part which contains partial cross section when the tire is mounted to the vehicle, figure 4 is a cross section drawing of IV-IV arrow side of figure 3, figure 5 is a cross section drawing of the enlarged main part, figure 6 is a conceptual drawing showing its operation, figure 7 is a conceptual drawing of its entirety, figure 8 is a flow chart showing its program of its control circuit. Figure 9 is a graph showing the relationship between running times of the vehicle, surface temperature of the grounding surface of the tire, and rolling resistance. Figure 10~12 are the drawings showing the traditional tire temperature raising device. Figure 10 is an outline drawing of the main part which contains its partial cross section. Figure 11 is a cross section drawing of its main part, figure 12 is a front surface drawing of its main part

11... tire temperature raising device

13... tire

28... steel cord (conductor)

32... coil (high frequency generating source)

35... high frequency generator (high frequency generating source)

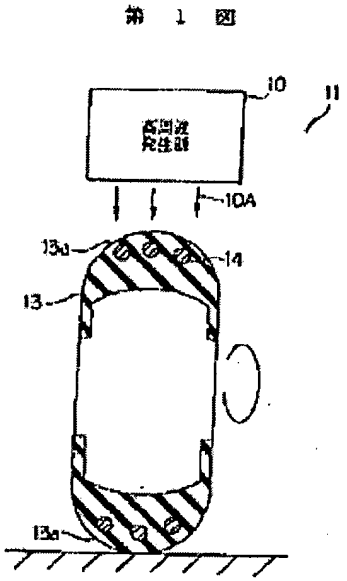
40... control means

41... tire surface temperature sensor (temperature sensor)

42... car speed sensor

43... control circuit (control means)

Figure 1



10... high frequency generator

Figure 2

Figure 3

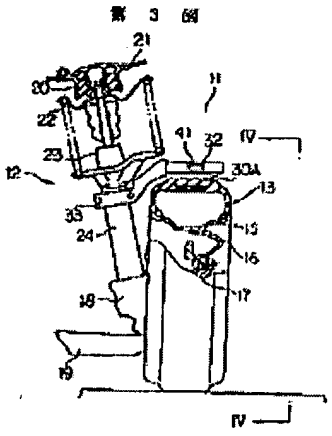


Figure 4

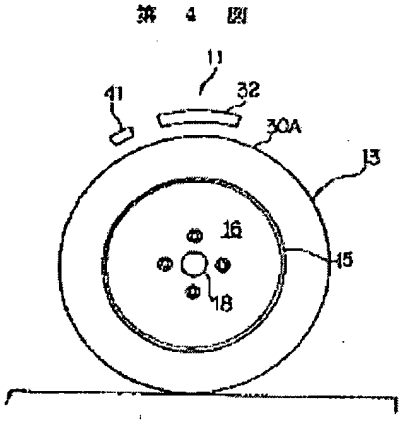


Figure 5

第 5 図

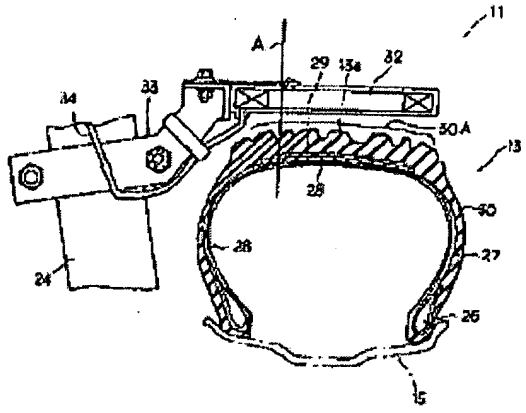


Figure 6

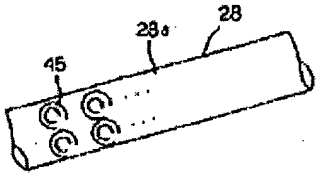


Figure 7

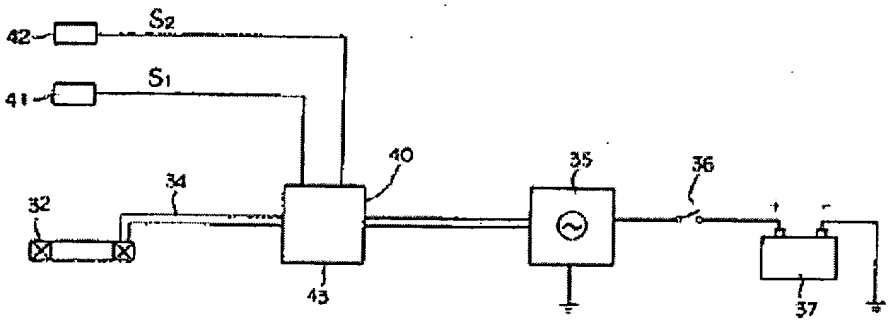
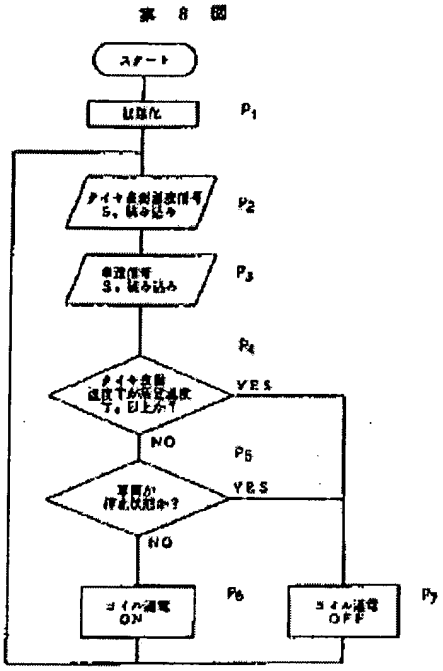
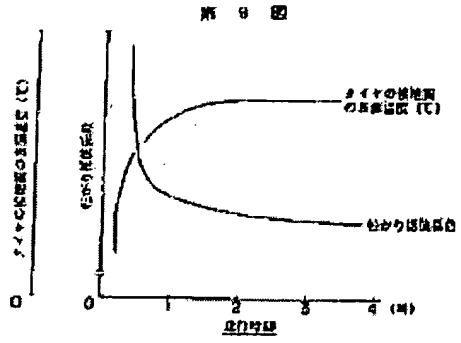


Figure 8



Start	
Initialization P1	
Tire surface temperature signals P2 Read S1	
Car speed signals P3 Read S1	
Tire surface speed T exceeds the specified temperature To? P4	
Vehicle in a stop state? P5	
Coil energization ON? P6	Coil energization off P7

Figure 9

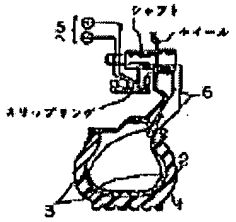


X1	X2	Surface temperature of tire grounding surface (deg C)
		Rolling resistance coefficient
		Progressing time

X1.. Surface temperature of the grounding surface of the tire

X2.. Rolling resistance coefficient

Figure 10

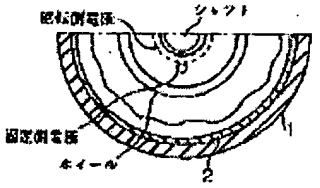


Shaft

Wheel

Slip ring

Figure 11

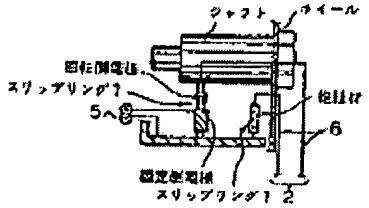


Rotating side electrode

Shaft

Fixed side electrode wheel

Figure 12



Start from the top center, clock wise

Shaft, wheel, insulating material, slip ring 2

Fixed side electrode

Slip ring 7

Rotation side electrode